Claims 1-68 are in this case. Claims 43-51 and 55-68 were withdrawn by the Examiner from consideration as drawn to a non-elected invention. Claims 8-10 have been rejected under § 112, second paragraph. Claims 1-5, 7, 35, 37, 39-41, 53 and 54 have been rejected under § 102(b). Claims 6, 11-16, 36, 38, 42 and 52 have been objected to. Claims 17-34 have been allowed. Claims 43-51 and 55-68 have been canceled. Dependent claims 8 and 9 have been amended. New independent claims 75-83 and new dependent claims 69-74 have been added.

The claims before the Examiner are directed towards methods of diminishing the effects of optical defects during real time use of an optical device. An optical part of the device is rotated during the use of the device to spread and blur the defects. The optical part may be a rotation-variant optical element that is used to spread and blur defects in light projected from a light source.

For an optical part that has an optical axis, the invention also includes a method of aligning the optical axis with the rotation axis and a method of stabilizing the position of the optical axis. The optical axis is aligned with the rotation axis by holding the optical part at two or more points of a peripheral structure that correspond to points of projection on the optical axis and moving the peripheral structure so as to move the points of projection towards the rotation axis. Once the two axes are aligned, the rotation of the optical part stabilizes the position of the optical axis by a gyro effect.

§ 112, Second Paragraph Rejections

The Examiner has rejected claims 8-10 under § 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Specifically, the Examiner has pointed out that the limitations of claim 8 are relevant only to the asynchronous rotation option of claim 7 but not to the synchronous rotation option of claim 7, and that the limitations of claims 9 and 10 are relevant only to the synchronous rotation option of claim 7 but not to the asynchronous rotation option of claim 7. Therefore, claim 8 now has been amended to limit the continuous rotation mode to asynchronous rotation and claim 9 now has been amended to limit the continuous rotation mode to synchronous rotation.

<u>§ 102(b) Rejections – Nakazawa</u>

The Examiner has rejected claims 1-5, 7, 35, 37, 39-41, 53 and 54 under § 102(b) as being anticipated by Nakazawa et al., JP 04021830 A (henceforth, "Nakazawa"). The Examiner's rejection is respectfully traversed.

Nakazawa teaches a variable apex angle prism 401 for minimizing image blurring in a camera. Prism 401 consists of two glass plates 402 and 403 connected by a flexible tube 404, with the chamber formed by plates 402 and 403 and tube 404 filled with a transparent liquid 405. In response to signals from blurring detecting means 1 through 7, glass plate 402 is tilted about horizontal (in Figure 4) axis 402a to compensate for angular deflections of the camera optics in the yaw direction, and glass plate 403 is tilted about a similar horizontal axis that is orthogonal to axis 402a to compensate for angular deflections of the camera optics in the pitch direction.

The crucial difference between the present invention and the teachings of Nakazawa lies in the opposite purposes of the two inventions. The purpose of the Nakazawa device is defined in the title of JP 04021830 as "image blurring <u>preventing</u>" (emphasis added). The purpose of the Nakazawa device is further defined in the abstract as follows:

> A variable apex angle prism is used as a correcting optical system 401 to be driven so as to correct image blurring...Consequently, image blurring preventing action can be executed without forcing a photographer to execute the complex operation. (emphasis added)

By contrast, the method of the present invention, as recited in independent claims 1 and 37, diminishes the "effects of optical defects and deviations during real time use of an optical device" by deliberately blurring the images acquired by the optical device and/or the light projected by the optical device. This is recited in step (c) of claim 1 as follows:

> rotating said at least one optical part of the optical device about a rotation axis during real time use of the optical device, by activating and controlling said optical rotation said optical rotation device, thereby spreading and blurring about said rotation axis the optical defects and the deviations present in said at least one optical part of the optical device (emphasis added)

and in step (c) of claim 37 as follows:

> rotating said at least one rotation variant optical element about a rotation axis during real time use of the optical device, by activating and controlling said optical rotation device, thereby spreading and blurring about said rotation axis the optical defects and the deviations present in said light rays of the light source passing through said at least one rotation variant optical element. (emphasis added)

Thus, far from being anticipated by Nakazawa, the present invention, as recited in claims 1 and 37, is not even obvious from Nakazawa. One ordinarily skilled in the art never would be led by a study of Nakazawa to compensate for optical defects and deviations by rotating an optical part or element to deliberately blur those effects, as in the present invention.

With independent claims 1 and 37 allowable in their present form, it follows that claims 2-5, 7 and 39-41, that depend therefrom, also are allowable.

Turning now to independent claims 35 and 53, it is clear that Nakazawa is not at all relevant to these claims.

Claim 35 recites a method of aligning the optical axis of an optical part with a rotation axis. Claim 53 recites a method, of stabilizing the position of an optical axis of an optical device, that includes the step of aligning the optical axis of an optical part of the device with a rotation axis. On page 31 line 11 of the specification, this "alignment" is defined as an effort to make the optical axis coincide "as best as possible" with the rotation axis.

The "optical parts" that Nakazawa rotates are plates 402 and 403. Nakazawa does not define the optical axes of plates 402 and 403; but as best understood, the optical axes of plates 402 and 403 are approximately parallel to rays a, b and c of Figure 4. Rays a, b and c of Figure 4 are approximately orthogonal to the rotation axes of plates 402 and 403. No useful purpose would be served by trying to align the optical axes of plates 402 and 403 with the rotation axes of plates 402 and 403. In fact, such an alignment would render Nakazawa's device inoperative.

With independent claim 53 allowable in its present form, it follows that claim 54, that depends therefrom, also is allowable.

Objections

The Examiner has objected to claims 6, 11-16, 36, 38, 42 and 52 as being based on rejected base claims. The Examiner has noted that claims 6, 11-16, 36, 38, 42 and 52 would be allowable if rewritten in independent form including all the limitations of the base claim and any intervening claim.

In view of the discussion above in the context of the § 102(b) rejections, Applicant submits that the base claims from which claims 6, 11-16, 36, 38, 42 and 52 depend are allowable, making claims 6, 11-16, 36, 38, 42 and 52 allowable in their present form.

Nevertheless, new claims 75 and 78-83 have been added. New claim 75 is claim 6 rewritten in independent form. New claim 78 is claim 11 rewritten in independent form. New claim 79 is claim 12 rewritten in independent form. New claim 80 is claim 14 rewritten in independent form. New claim 81 is claim 38 rewritten in independent form. New claim 82 is claim 42 rewritten in independent form. New claim 83 is claim 52 rewritten in independent form.

Other New Claims

New claims 69-74 have been added to further distinguish the present invention from the teachings of Nakazawa.

The specific aspect of the present invention that is recited in claims 69-74 is the extent of the rotation of the optical part. It is clear that the degree of tilt envisioned by Nakazawa is at most several degrees. By contrast, in the present invention, the optical part is rotated at least 90 degrees, and usually is rotated at least a full 360 degrees. This feature of the present invention is taught, *inter alia*, in the following two paragraphs from page 34 line 17 through page 35 line 12 of the specification:

> General steps of rotating the at least one optical part according to the discontinuous rotation mode include (i) rotating the at least one optical part of the optical device through a full circle, or 360 degrees, with a whole number, N, equal to or greater than two, of stops, at unequally or equally spaced angular intervals...As indicated, the discontinuous rotation mode is applicable to both viewing and projecting optical devices.
>
> By having two stops, preferably at 0 degrees and at 180 degrees, the rotated optical part of the optical device sequentially faces two opposite directions, thereby causing defects and deviations of the optical part to also face in opposite directions...As the number, N, of rotational stops increases, such as by sequentially stopping at every 90 degrees through the circle of rotation, accuracy of averaging the larger number of independently measured and analyzed images increases...

New dependent claims 69 and 72 require that the rotations recited in claims 1 and 37, respectively, be at least 90 degrees. New dependent claims 70 and 73 require that the rotations recited in claims 1 and 37,, respectively, be at least 180 degrees. New dependent claims 71 and 74 require that the rotations recited in claims 1 and 37, respectively, be at least 360 degrees.

Support for new claims 69-74 is found in the above citation from page 34 line 17 through page 35 line 12 of the specification. Support for the 90 degree limitation is found on page 35 lines 6-7 ("...sequentially stopping at every 90 degrees..."). Support for the 180 degree limitation is found on page 34 line 29 ("By having two stops, preferably at 0 degrees and at 180 degrees..."). Support for the 360 degree limitation is found on page 34 lines 18-19 ("...rotating the at least one optical part of the optical device through a full circle, or 360 degrees...").

The Examiner rejected claims 8-10 under § 112, second paragraph, but not under § 102(b). Applicant therefore infers that if claims 8-10 as filed had been in conformity with § 112, second paragraph, the Examiner would not have rejected these claims, but would have only objected to them as being based on rejected base claims. Therefore, new claims 76 and 77 have been added. New claim 76 is claim 8, amended as described above to be in conformity with § 112, second paragraph and rewritten in independent form. New claim 77 is claim 9, amended as described above to be in conformity with § 112, second paragraph and rewritten in independent form.

Drawings

The Examiner has observed that Figures 1 and 2 should be designated by a legend such as "Prior Art". Attached please find copies of Figures 1 and 2 so designated, in red.

In view of the above amendments and remarks it is respectfully submitted that independent claims 1, 17, 35, 37, 53 and 75-83, and hence dependent claims 2-16, 18-34, 36, 38-42, 52, 54 and 69-74 are in condition for allowance. Prompt notice of allowance is respectfully and earnestly solicited.

Respectfully submitted,

Mark M. Friedman
Attorney for Applicant
Registration No. 33,883

Date: July 24, 2003

VERSION WITH MARKINGS TO SHOW CHANGES MADE

In the claims:

8. (Amended) The method of claim 7, whereby said continuous rotation mode is asynchronous, and whereby said asynchronous rotation with respect to said exposure time of said peripheral mechanism features the step of rotating said at least one optical part of the optical device a number of rotations during said exposure time, said number of rotations is selected from the group consisting of a single rotation, a fraction of said single rotation, and a plurality of said single rotation, thereby spreading and blurring the optical defects and the deviations of said at least one optical part of the optical device over at least a portion of a circle.

9. (Amended) The method of claim 7, whereby said continuous rotation mode is synchronous, and whereby said synchronous rotation with respect to said exposure time of said peripheral mechanism features the step of rotating said at least one optical part of the optical device at a constant angular rotation speed such that an exact whole number of rotations are completed during said exposure time of said peripheral mechanism, thereby circularly symmetrically spreading and blurring the optical defects and the deviations of said at least one optical part of the optical device over a full 360 degrees circle, thereby achieving circular symmetry with respect to the optical defects and the deviations of said at least one optical part of the optical device during real time use of the optical device.

69. (New) The method of claim 1, wherein said at least one optical part of the optical device is rotated by at least about 90 degrees.

70. (New) The method of claim 1, wherein said at least one optical part of the optical device is rotated by at least about 180 degrees.

71. (New) The method of claim 1, wherein said at least one optical part of the optical device is rotated by at least about 360 degrees.

72. (New) The method of claim 37, wherein said at least one rotation variant optical element is rotated by at least about 90 degrees.

73. (New) The method of claim 37, wherein said at least one rotation variant optical element is rotated by at least about 180 degrees.

74. (New) The method of claim 37, wherein said at least one rotation variant optical element is rotated by at least about 360 degrees.

75. (New) A method for diminishing effects of optical defects and deviations during real time use of an optical device, comprising the steps of:

(a) providing an optical rotation device for rotating at least one optical part of the optical device during real time use of the optical device; and

(b) rotating said at least one optical part of the optical device about a rotation axis during real time use of the optical device, by activating and controlling said optical rotation device, thereby spreading and

blurring about said rotation axis the optical defects and the deviations present in said at least one optical part of the optical device;

whereby the step of rotating said at least one optical part of the optical device is effected according to two rotation parameters, said two rotation parameters are rotation mode and rotation speed, said rotation mode is selected from the group consisting of discontinuous rotation and continuous rotation, said discontinuous rotation mode featuring the steps of:

(i) discontinuously rotating said at least one optical part of the device through a full circle of 360 degrees, with a whole number of stops selected from the group consisting of two and greater than two, at spaced angular intervals selected from the group consisting of unequally spaced and equally spaced, whereby at each said stop a new image is produced;

(ii) performing image analysis on each said new image, thereby generating a set of analyzed images; and

(iii) numerically processing said set of analyzed images according to an algorithm, said algorithm including averaging, to produce a single combined image analysis result.

76. (New) A method for diminishing effects of optical defects and deviations during real time use of an optical device, comprising the steps of:

(a) providing an optical rotation device for rotating at least one optical part of the optical device during real time use of the optical device; and

(b) rotating said at least one optical part of the optical device about a rotation axis during real time use of the optical device, by activating

and controlling said optical rotation device, thereby spreading and blurring about said rotation axis the optical defects and the deviations present in said at least one optical part of the optical device;

whereby the step of rotating said at least one optical part of the optical device is effected according to two rotation parameters, said two rotation parameters are rotation mode and rotation speed, said rotation mode is selected from the group consisting of discontinuous rotation and continuous rotation, with respect to exposure time of a peripheral mechanism of the optical device, said peripheral mechanism is selected from the group consisting of a viewing mechanism and a projecting mechanism, said viewing mechanism includes a camera, said projecting mechanism includes a radiation source, said continuous rotation mode being asynchronous, said asynchronous rotation with respect to said exposure time of said peripheral mechanism featuring the step of rotating said at least one optical part of the optical device a number of rotations during said exposure time, said number of rotations is selected from the group consisting of a single rotation, a fraction of said single rotation, and a plurality of said single rotation, thereby spreading and blurring the optical defects and the deviations of said at least one optical part of the optical device over at least a portion of a circle.

77. (New) A method for diminishing effects of optical defects and deviations during real time use of an optical device, comprising the steps of:

(a) providing an optical rotation device for rotating at least one optical part of the optical device during real time use of the optical device; and

(b) rotating said at least one optical part of the optical device about a rotation axis during real time use of the optical device, by activating

and controlling said optical rotation device, thereby spreading and blurring about said rotation axis the optical defects and the deviations present in said at least one optical part of the optical device;

whereby the step of rotating said at least one optical part of the optical device is effected according to two rotation parameters, said two rotation parameters are rotation mode and rotation speed, said rotation mode is selected from the group consisting of discontinuous rotation and continuous rotation, with respect to exposure time of a peripheral mechanism of the optical device, said peripheral mechanism is selected from the group consisting of a viewing mechanism and a projecting mechanism, said viewing mechanism includes a camera, said projecting mechanism includes a radiation source, said continuous rotation mode being synchronous, said synchronous rotation with respect to said exposure time of said peripheral mechanism featuring the step of rotating said at least one optical part of the optical device at a constant angular rotation speed such that an exact whole number of rotations are completed during said exposure time of said peripheral mechanism, thereby circularly symmetrically spreading and blurring the optical defects and the deviations of said at least one optical part of the optical device over a full 360 degrees circle, thereby achieving circular symmetry with respect to the optical defects and the deviations of said at least one optical part of the optical device during real time use of the optical device.

78. (New) A method for diminishing effects of optical defects and deviations during real time use of an optical device, comprising the steps of:

(a) providing an optical rotation device for rotating at least one optical part of the optical device during real time use of the optical device; and

(b) rotating said at least one optical part of the optical device about a rotation axis during real time use of the optical device, by activating and controlling said optical rotation device, thereby spreading and blurring about said rotation axis the optical defects and the deviations present in said at least one optical part of the optical device;

whereby the optical device is a folded optical device selected from the group consisting of a folded optical device for viewing and a folded optical device for projecting.

79. (New) A method for diminishing effects of optical defects and deviations during real time use of an optical device, comprising the steps of:

(a) providing an optical rotation device for rotating at least one optical part of the optical device during real time use of the optical device, said optical rotation device comprising:

(i) a column for containing at least one optical part of the optical device,

(ii) a mount for holding said column, said mount including a sleeve,

(iii) a rotation mechanism for enabling rotation of said mount,

(iv) a rotation mechanism housing for housing said rotation mechanism,

(v) a motor for actuating rotation of said mount,

(vi) a transmission for enabling said motor to effect rotation of said mount, and

(vii) an adjustment mechanism for adjusting a position of said column relative to said mount; and

(b) rotating said at least one optical part of the optical device about a rotation axis during real time use of the optical device, by activating and controlling said optical rotation device, thereby spreading and blurring about said rotation axis the optical defects and the deviations present in said at least one optical part of the optical device.

80. (New) A method for diminishing effects of optical defects and deviations during real time use of an optical device, comprising the steps of:

(a) providing an optical rotation device for rotating at least one optical part of the optical device during real time use of the optical device, said optical rotation device comprising:

(i) a column for containing the at least one optical part of the optical device,

(ii) a mount for holding said column, said mount including a sleeve,

(iii) a ring for providing slight freedom of movement required to align said column with respect to said mount,

(iv) a main rotation mechanism for enabling rotation of said mount,

(v) a main rotation mechanism housing for housing said main rotation mechanism,

(vi) a motor for actuating rotation of said mount,

(vii) a transmission for enabling said motor to effect rotation of said mount,

(viii) two self-aligned rotation mechanisms positioned at either side of said main rotation mechanism,

(ix) pre-loaded flexures for mounting, holding, and moving said two self-aligned rotation mechanisms, and

(x) two sets of actuators for actuating said pre-loaded flexures; and

(b) rotating said at least one optical part of the optical device about a rotation axis during real time use of the optical device, by activating and controlling said optical rotation device, thereby spreading and blurring about said rotation axis the optical defects and the deviations present in said at least one optical part of the optical device.

81. (New) A method for diminishing effects of optical defects and deviations during real time use of an optical device, the optical device including a light source, comprising the steps of:

(a) including at least one rotation variant optical element in the optical device, such that the light source generates light rays passing through said at least one rotation variant optical element;

(b) providing an optical rotation device for rotating said at least one rotation variant optical element during real time use of the optical device; and

(c) rotating said at least one rotation variant optical element about a rotation axis during real time use of the optical device, by activating and controlling said optical rotation device, thereby spreading and blurring about said rotation axis the optical defects and the deviations

present in said light rays of the light source passing through said at least one rotation variant optical element;

wherein at least one of said at least one rotation variant optical element is a prism.

82. (New) A method for diminishing effects of optical defects and deviations during real time use of an optical device, the optical device including a light source, comprising the steps of:

(a) including at least one rotation variant optical element in the optical device, such that the light source generates light rays passing through said at least one rotation variant optical element;

(b) providing an optical rotation device for rotating said at least one rotation variant optical element during real time use of the optical device; and

(c) rotating said at least one rotation variant optical element about a rotation axis during real time use of the optical device, by activating and controlling said optical rotation device, thereby spreading and blurring about said rotation axis the optical defects and the deviations present in said light rays of the light source passing through said at least one rotation variant optical element;

whereby the optical device is a folded optical device selected from the group consisting of a folded optical device for viewing and a folded optical device for projecting.

83. (New) A method for diminishing effects of optical defects and deviations during real time use of an optical device, the optical device including a light source, comprising the steps of:

(a) including at least one rotation variant optical element in the optical device, such that the light source generates light rays passing through said at least one rotation variant optical element;

(b) providing an optical rotation device for rotating said at least one rotation variant optical element during real time use of the optical device; and

(c) rotating said at least one rotation variant optical element about a rotation axis during real time use of the optical device, by activating and controlling said optical rotation device, thereby spreading and blurring about said rotation axis the optical defects and the deviations present in said light rays of the light source passing through said at least one rotation variant optical element;

wherein at least one of said at least one rotation variant optical element is a dove prism.

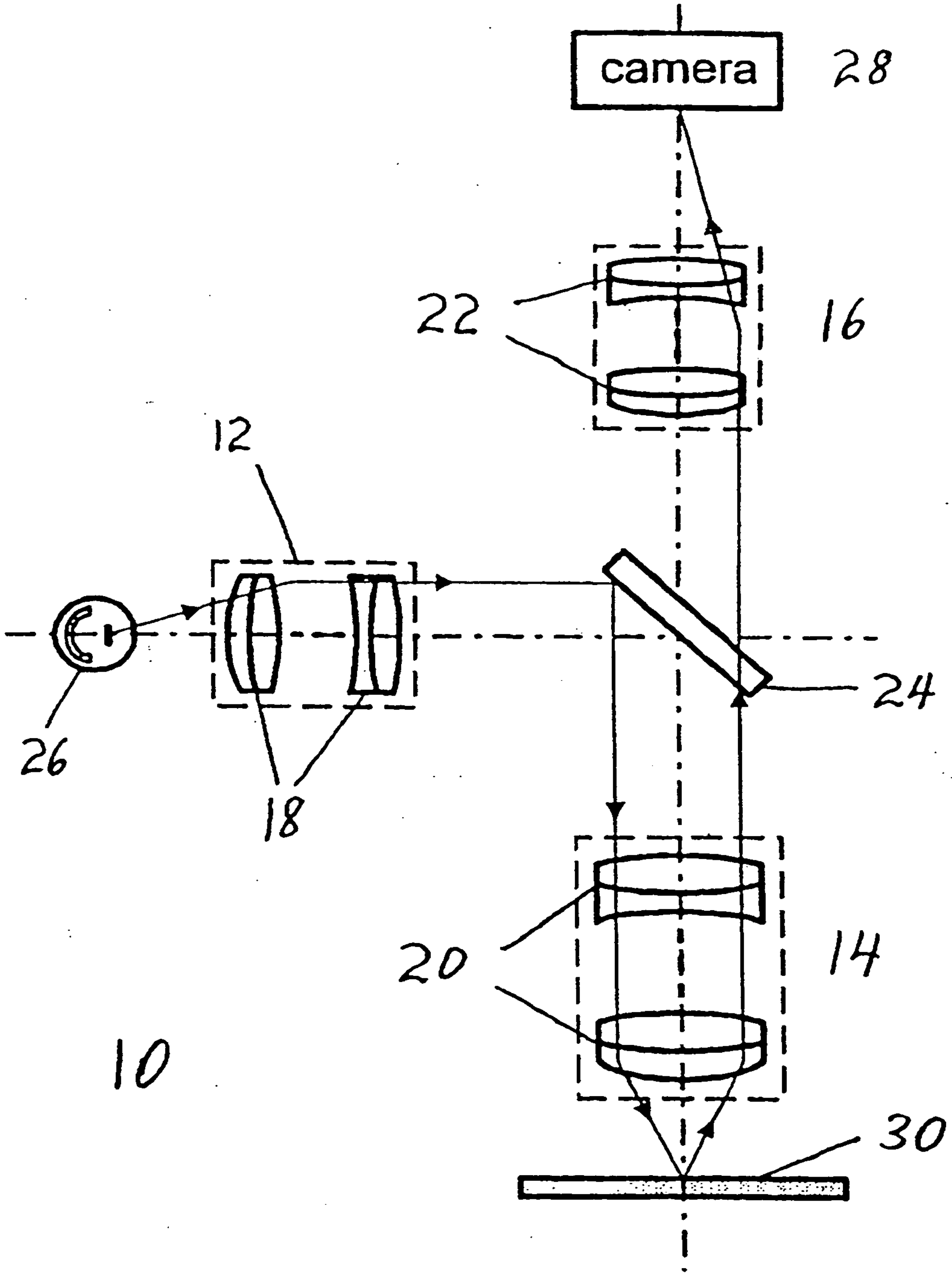

FIG. 1 (PRIOR ART)

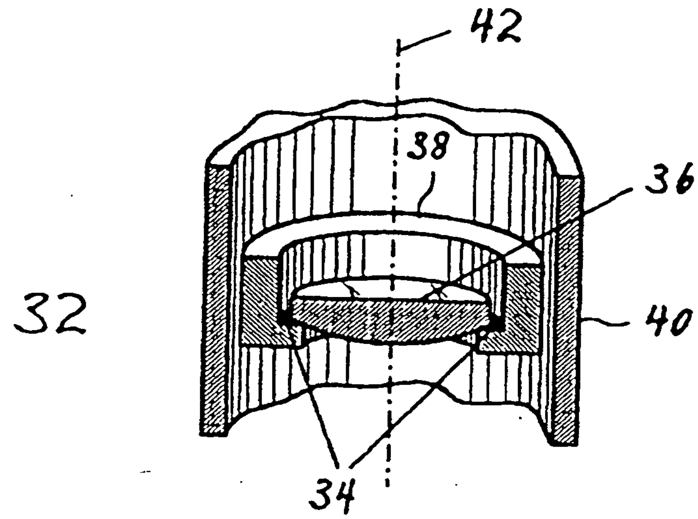

FIG. 2
(PRIOR ART)

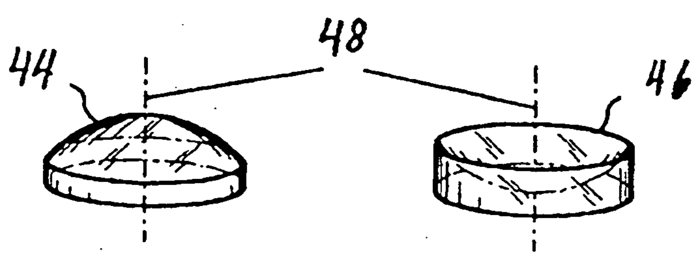

FIG. 3